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of having our students retain something of the subject-matter of the courses we teach. Evidently it is here that memory, based on understanding, should rightly be used. I sometimes think we might in some way collectively take out insurance against a student's arriving at the junior year in college in the belief that two triangles are similar whenever they have a side in common.

RECENT PUBLICATIONS.

REVIEW.

Introductory Mathematical Analysis. By W. PAUL WEBBER and LOUIS C. PLANT. New York, Wiley, 1919. 13 + 304 pages. Price $2.00.

This combination book for freshmen covers plane trigonometry and topics from advanced algebra, analytic geometry, and the calculus, which are treated in the order named.

The first seven chapters (70 pages) may be said to form an introduction containing a review of algebra and geometry, and such general topics as computations, including logarithms and the slide rule, rectangular coördinates with graphical representations of statistics and equations, classes of numbers, variables, functions, and limits. Interpolation in tables involving two independent variables is given, and simple problems to determine the form of an equation representing a given empirical table are solved. In a later chapter some problems of the latter sort are solved by using logarithmic and semi-logarithmic paper.

Chapter VIII (50 pages) gives the usual course in plane trigonometry in condensed form. In defining the six functions a tabular form is used in which a row is given to each function and a column to an angle in each of the four quadrants, a point $P_1(x_1,y_1)$ being chosen on the terminal line of an angle α_1 in the first quadrant, a point $P_2(x_2, y_2)$ on the terminal line of an angle α_2 in the second quadrant, etc. The table includes, in parentheses, the sign of each function for each quadrant. A radian "is defined by the equation Arc $AB = r\cdot\theta$, where r is the radius of the arc AB and θ is the angle in radians." Portions of a traverse table and of a table of haversines, and some problems in indirect fire, appear among the applications.

The chapter on the circular functions is followed by one on polar coördinates, complex numbers, and vectors, which connects trigonometry with algebra. Vector and scalar products are given considerable attention, with application to equilibrium of particles and rigid bodies. A short chapter on equations gives a few of the theorems from the theory of equations, but the opportunity to tie it to the preceding chapter by the theorem that complex roots occur in conjugate pairs was not improved. The reviewer holds no brief for this theorem, especially as he thinks other material more suitable for and valuable to freshmen than complex numbers, but the omission is noticeable in a text which considers the derivative of u^n for a complex value of n, which treats series with complex terms, and which expresses the sine and cosine in the well-known exponential forms in order to obtain their derivatives. Real roots of equations of higher than the second degree are approximated by synthetic division without shifting the y-axis.

The chapters on analytic geometry (41 pages) are devoted chiefly to the straight line and conic sections. These are treated very compactly, but with the completeness of many texts. Space is saved in the chapter on conics by leaving much of the theory to be worked out as exercises. For example, the equation of an ellipse is derived in the form

$$(1 - e^2)x^2 - 2epx + y^2 = 0,$$

and the following exercises given.

"2. Move the origin to the point $(ep/(1 - e^2), 0)$ to remove the term in the first power of x."

"3. Call $ep/(1 - e^2) = a$ and $(1 - e^2)a^2 = b^2$ in the equation obtained in example (2) and show that the equation reduces to

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1."$$

Nearly a third of the book (88 pages) is given to the calculus. The ϵ, δ form of proof is used for the preliminary theorems on limits, the derivative introduced in a purely formal way, and the theorems necessary for differentiating algebraic functions, implicit as well as explicit, are obtained before it comes to light that the derivative has any concrete significance, either as the slope of a tangent line or as a rate. Series receive an extended treatment. Maclaurin's series is obtained by differentiating an assumed expansion and determining the coefficients. The function e^x is defined as a series, and the expansion of $e^{\Delta u}$ is the basis for obtaining the derivative of e^u. Integration is considered as the inverse of differentiation, and also as the limit of a sum. The applications of the calculus most emphasized are tangent lines, maxima and minima, velocity and acceleration, plane areas, volume of a solid of revolution, work, and centroids.

Much of the material is presented in a very compact form, so that, as stated in the preface, "The teacher will find an opportunity for originality in developing the text and at times a necessity for more details." The authors' style is sometimes abrupt, as in the sentence "Let student solve and verify," and a few sentences are open to more serious criticisms. For example: "Let x be a variable and a some constant. Then if $a - x$ assumes its sequence of values in order, there comes a stage, such that, for all subsequent values of x, the numerical value of $a - x$ becomes and remains less than any assigned small value ϵ, then a is called the **limit** of x" (page 64). "If, at a given instant of time, the speed of a body becomes uniform, then the distance Δs, passed over in the time Δt, is the instantaneous speed at the given instant" (page 214). The treatment of instantaneous speed which follows the latter quotation is unsatisfactory in that it confuses two different meanings of Δs.

ARTHUR SULLIVAN GALE.

BRIER HILL, N. Y.,
August, 1919.